DOCUMENT RESUME

ED 252 336 RC 015 082

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TITLE Computer Assisted Instruction for Native American Students.
PUB DATE 4 Oct 84
NOTE 16p.; Paper presented at the Annual Northern Rocky Mountain Educational Research Association Meeting (2nd, Jackson Hole, WY, October 4-6, 1984).
PUB TYPE Reports - Descriptive (141) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS *American Indian Education; Computer Assisted Instruction; Elementary Education; *Limited English Speaking; *Program Evaluation; *Reading Achievement; *Student Evaluation; *Student Improvement
IDENTIFIERS Comprehensive Tests of Basic Skills; *Lakota (Tribe); Normal Curve Equivalent Scores; South Dakota (Rapid City)

ABSTRACT

Evaluation at the end of the first year of a 3-year project to use microcomputers to improve the reading and language skills of Limited English Proficient (LEP) Native American students revealed that the major objective was not reached, but there were achievements nonetheless. Lakota (Sioux) children constitute 10% of the Rapid City, South Dakota school population; the project focused on two elementary schools with the highest numbers of Lakota children. In these two schools, 79% of the Lakota students (grades 3-6) were found to be LEP. According to the project's objectives, at the end of the first year 75% of the students would gain a minimum of 3 Normal Curve Equivalents (NCEs) as measured by pre- and post-testing with the Comprehensive Tests of Basic Skills (CTBS). Composite reading scores (N=72) were enhanced at both schools; although the 75% objective was not realized, 59.8% of School A participants and 55.3% of School B participants met the established criterion level. About one-third of the students doubled the established minimum and achieved an NCE growth of 6.0 or greater. Four students in each school raised their scores by 20 NCEs or more. Poor record keeping hampered comparative evaluation of computer assisted instruction processes. (BRR)

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ED252336

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COMPUTER ASSISTED INSTRUCTION FOR NATIVE AMERICAN STUDENTS

A Paper Presented At The
Northern Rocky Mountain Educational
Research Association Annual Meeting
(Jackson Hole, WY, October 4-6, 1984).
October 4, 1984

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RC015082

This paper was developed from the final evaluation of the Year I (1982-83) phase of the program "Computer Assisted Instruction for Bilingual/Bicultural Students" funded by the Office of Bilingual Education and Minority Language Affairs (OBEMLA), an office of the U. S. Department of Education. The grant is administered through the Office of Bilingual/Bicultural Education, an agency of the Rapid City Area School District 51-4.

General Overview

The ultimate goal of the three-year project was to improve the reading and language skills of an identified group of Limited English Proficient (LEP) Native American students.

Lakota (Sioux Indian) children constitute 10% of the Rapid City school population. The project was focused in the two elementary schools which contain the highest numbers of Lakota children. The percentages noted were 55% and 38% respectively. Indian children who were identified as LEP (< 50 percentile) were chosen as participants.

The unique characteristic of the project was the focus upon the application of microcomputers and microcomputer software in realizing the overall project goals.

Since the use of such a technologically innovative approach was so new, very little research had been evidenced that provided process models and/or assistance in this area. Hence, the project was plowing

new ground in the areas of curriculum development and pedagogy and had implications for baseline research, as well as the fulfillment of the immediate educational goal. The actual purpose of the project was:

1. To develop and incorporate into purchased educational programs instructionally appropriate Lakota cultural and English language arts and reading material.
2. To develop pedagogically appropriate programmed materials for use with microcomputers.
3. To train instructional staff in the methods of CAI technology and relevant bilingual education methodology.

As stated above, during the first year, the project was focused upon the Lakota children in two target schools. In these two schools, 79% of the Lakota students (grades 3-6) were found to have Limited English Proficiency. These students were chosen using a combination of methods including: (a) standardized test scores, (b) assessment scale scores, (c) a review of demographic information which included family income, and (d) teacher/principal input. In all, a total of 72 students were involved.

Objectives

The grant proposal delineated the objectives according to those which were to be achieved upon the completion of the three-year project and those which were to be achieved upon the completion of the first year of the project (Year I). These objectives for Year I were as follows:

1.0 At the conclusion of the first year, 75% of the LEP students shall gain a minimum of three Normal Curve Equivalents (NCEs) as measured by the Comprehensive Test of Basic Skills (CTBS).

2.0 The bilingual education project will have established a method for identifying those children who have achieved proficiency in the English language.

3.0 The bilingual education project will have established an exit system for transferring those children who have achieved proficiency in the English language as measured by the exit criteria.

4.0 By the end of the first project year 95% of the bilingual education staff will have participated in all training and technical assistance activities.

5.0 By the end of the first project year 95% of the bilingual education instructional staff will have received training in the operation of the desk top microcomputers and methods for developing new CAI programs.

It should be noted that this paper was limited to an examination of Objective 1.0 above, and in the interest of establishing educational effectiveness, went into greater detail than is evidenced in the general thrust of the first objective. Therefore, the major focus in this paper was placed upon statistical evidence of effectiveness (product elements) rather than processes.

Methodology

The evaluation of Objective 1.0 as addressed in the evaluation plan was enhanced with other (more specific) elements which called for additional analysis. These included comparisons by school by grade as well as for the grade and project totals. This process was established in the interest determining whether or not any statistically significant gains had occurred.

Model

To address these dimensions, the Norm-Referenced evaluation model (N-RM) was employed. In the N-RM the performance or gains of the treatment group is compared to the performance of the norming sample, i.e., the group from whose performance the test forms were derived. Therefore, the norming sample (national norms) are used as a comparison group against which to compare the growth or gains of the program group.

Since the Comprehensive Test of Basic Skills (CTBS) is a normed test, a process was established to determine whether or not the project participants improved their achievement status with respect to the norm group from pre to post (fall to spring) testing. The expectation (null hypothesis) for achievement in the absence of the program was that students would maintain (or decrease) their achievement status with respect to the national norms from pre to post test. That is, if a child was to score at an NCE of 25 using fall norms, he/she would be expected to maintain an NCE score of 25 on the post test when spring norms were applied to his/her new score. If a project is effective, then we would expect that the same child to score $>$ 25 NCE

at the time of the post test. The pre-test scores were therefore used to generate post test expected scores (25/25) which were compared with the post test (obtained) scores using the t test for determining the statistical significance between testing times. Rejection limits were based on a one-tailed probability and therefore if the computed t probability was less than, or equal to .05, the project would have produced statistically significant achievement gains. The Rapid City compensatory education program uses growth of 3 NCEs as the criterion level for educationally significant growth, and 5 NCEs as being "highly significant".

All normed tests were administered within two weeks of the dates on which the fall and spring norms were obtained. The data collection norm referenced comparison was limited to the Composite Reading Score of the CTBS.

Analysis of CTBS Scores

Means and range of scores for the composite reading subscale by school and by total were reported in Table 1. One caution that affects the overall study should be noted in this table. Due to a later start and a problem with file management at School B only 70 days of exposure were accounted for on project records as opposed to 123 days at School A.

As can be noted, composite reading scores were enhanced in both schools (39.91 - 44.94 and 37.92 - 41.53 respectively) as well as in the overall scores which revealed a mean average of 38.86 NCE in the fall which was increased to an average 43.14 NCE in the spring. This

TABLE 1

SUMMARY TABLE OF SCALE MEANS, RANGE
AND ATTENDANCE BY SCHOOL

	Scale Means (Range) and Attendance				
School	FALL NCE	SPRING NCE	DAYS TOTAL	OUT ABS.	IN ABS.
School A (N=34)	39.91 (20-54)	44.94 (25-85)	102.74 (60-123)	8.12 (1-24)	5.85 (1-29)
School B (N=38)	37.92 (10-57)	41.53 (8-85)	51.23 (24-70)	NOT AVAILABLE	NOT AVAILABLE
Overall (N=72)	38.86 (10-57)	43.14 (8-85)	76.61 (24-123)	8.12* (1-24)	5.85* (1-29)

* Includes only School A totals.

amounted to an increase of 5.03 NCEs at School A, 3.61 NCEs at School B and 4.28 NCEs overall. These differences reflect educational significance as interpreted by Rapid City compensatory education criterion levels and the gain at School A (5.03) fell into the highly significant category.

Group Comparisons t Test

As stated in the evaluation plan these distributions were also to be subjected to the *t* test for correlated means in the interest of determining statistical significance of the difference. Since positive growth was predicted, the one-tailed test of significance ($P < .05$) was applied. The results of this analysis was reported in Table 2.

As can be noted, Table 2 was used to summarize the means and *t* differences by grade and by school as well as for the total group. Significant *t* values were evidenced at School A in grade three ($t = 2.45$, $P < .022$), grade six ($t = 2.43$, $P < .016$), and in the overall scores ($t = 2.85$, $P < .003$). At School B, significant *t* values were noted at grade five ($t = 1.89$, $P < .043$) and in overall comparison ($t = 1.84$, $P < .037$).

When scores from both schools were combined and tested it was revealed that the mean growth (38.86 NCEs - 43.14 NCEs) was significant at the .001 level of probability as reflected in the *t* value of 3.24.

TABLE 2

SUMMARY TABLE OF MEANS, t DIFFERENCES,
AND ONE-TAILED PROBABILITY LEVELS BY
GRADE BY SCHOOL BY TOTAL

School	Grade (N)	Fall NCE Means	Spring NCE Means	t	P*
School A	3(8)	36.75	46.88	2.45	.022
	4(4)	39.25	53.50	1.81	.083
	5(10)	40.50	40.40	-0.03	.436
	6(12)	41.75	44.58	2.43	.016
Overall	(34)	39.91	44.94	2.85	.003
School B	3(7)	42.14	47.71	1.07	.167
	4(12)	41.92	43.33	0.34	.369
	5(11)	36.00	42.18	1.89	.043
	6(8)	30.88	32.50	0.48	.322
Overall	(38)	37.92	41.53	1.84	.037
Total	Both (72)	38.86	43.14	3.24	.001

* 1 Tailed Probability

Individual Student Growth

The basic objective as stated previously alluded to individual growth by stating that 75% of the participants would gain a minimum of 3.0 NCEs as measured by the CTBS. The data summarizing this growth was reported in Table 3. As can be noted, this objective was not realized. A total of 59.8% of the School A participants, 55.3% of the School B students and 56.9% of the total group met the established criterion level. It should be noted, however, that about a third (35.3%, 31.6% and 32.3% respectively) of the student doubled this established minimum level by achieving an NCE growth of 6.0 or greater. Four of the students in each school actually raised their scores by 20 NCEs or more, and high gains were noted as being 37 NCEs at School A (1 student) and 33 NCEs (2 students) at School B.

CAI Evaluation

The evaluation plan addressed the actual effectiveness of the different CAI processes which were to be compared with any growth evidenced in test scores and/or classroom achievement. The objective here was to pinpoint those elements of treatment processes which had the greatest effect upon growth in the Composite Reading Score (CTBS).

Due to the inadequacy of the records and files, student records in regard to classroom achievement processes were not in evidence at the time of the analysis. This process was, therefore, limited to a regression approach to determine the relationship between the one dependent variable, NCE growth and the three independent variables of daily attendance and absenteeism along with the six software packages and total software activity.

TABLE 3

SUMMARY TABLE OF PERCENTAGE OF STUDENTS ACHIEVING NCE GROWTH OF 3.0-6.0 OR GREATER BY SCHOOL BY TOTAL

Schools	N	% Achieving Growth of 3.0 NCEs or More			
		3.0 or More	4.0 or More	5.0 or More	6.0 or More
School A	34	59.8	48.1	44.1	35.3
School B	38	55.3	50.0	34.2	31.6
Total	72	56.9	48.6	38.9	32.3

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A total of ten independent or predictor variables were entered into the regression in an attempt to determine which dimension of the treatment processes had the greatest effect upon gain in the dependent (criterion) variable NCE growth on the Composite Reading Score. These predictor variables were:

1. Total days in the project.
2. Number of out-of-school absences.
3. Number of in-school absences.
4. Amount of activity on the PAL software (Universals Systems of Education).
5. Amount of activity on the BLS software (Ombudsmann Services).
6. Amount of activity on Hartley software (Hartley Publications).
7. Activity on Borg-Warner software (Borg-Warner Publications).
8. Activity with paper and pencil worksheets related to various software packages.
9. Amount of activity with Data Command software (Imperial International Incorporated).
10. Composite software activity (a total count of all software activity).

Attendance and absentee data were reported above (see Table 3) while mean software activity was summarized in Table 4. It should be noted that attendance data at School B was incomplete. Although the regression program employed in the computer analysis of this data was designed to cope with such missing data points, the results were inconclusive and therefore not included in this report.

Table 4

SUMMARY TABLE OF MEAN SOFTWARE ACTIVITY BY SCHOOL

School	Software Activity & (Range)						
	PAL	BLS	HARTLEY	BORG-W	PAPER	DATA-C	COMPOSITE
School A	41.32 (20-66)	7.46 (1-13)	14.03 (7.34)	3.27 (1-6)	8.79 (4-16)	7.06 (2-8)	80.64 52-129
School B	35.64 (14-65)	8.56 (5-19)	55.81 (17-95)	0.0	5.71 (1-14)	4.39 (1-9)	111.06 36-172
Total	38.40 (14-66)	8.03 (1-19)	36.48 (7-95)	2.27 (1-6)	7.23 (1-16)	5.75 (1-9)	96.29 (36-172)

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Discussion

After experiencing setbacks during the first two months of implementation, the project seemed to move along well in regard to the general thrust as outlined in the grant proposal.

The project is innovative in nature and since little research is available from which to draw operational models it would be expected that first year start-up activities be subject to singular problems.

The Computer Specialist (CS) was well-qualified, competent and efficient. This person is instrumental in the establishment/coordination of projects such as this. The Computer Specialist should be commended and supported during Year II of the project. It is important to note that her efforts in this project are first priority in regard to any subsequent needs of the school district. The technical skills this person brings to the project are crucial and should not be supplanted.

The Norm Referenced Model (N-RM) as established was appropriate and functioned well in the areas where data files were available. The testing times for the CTBS norming processes were well within established limits of the N-RM. There was significant growth ($P = < .05$) in composite reading NCE scores at both schools and for the project overall. This was perhaps the most important evaluation element in the overall project.

The specific goal of 75% of the participants gaining a minimum of 3.0 NCEs as measured by the CTBS was not realized. However, nearly 60% (56.9) of the students attained this amount of growth of 6.0 NCEs or more. This was really a substantive finding when one recognizes

the fact that the project had a late start and that many of the Lakota students tend to be transient.

The results of the CAI regression run were inconclusive and therefore not included in this report. This was chiefly due to inconsistent attendance/participation records. This will be addressed in Year II of the project.